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The Apple,
King of Fruits.
by
George T. Powell.



Class SB 363

Book P8

THE APPLE KING OF FRUITS

Practical Facts and Suggestions
About Its Culture ❁ ❁ ❁

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THE APPLE, KING OF FRUITS

Propagation



MUSHROOM may complete its growth in twenty-four hours, but an apple tree not in a century. Hence, in planting this most desirable of all fruit trees, it is of vital importance that the best conditions be combined in the tree itself. This should be followed by the best methods of after care and management.

There are questions that come to those who are interested in the planting of trees which are overlooked by many writers who do not sufficiently treat many points, or even make them clear to the inexperienced, taking for granted that they do not require plain information in its varied details. In the preparation of this brief treatise no operation in orchard management however small, will be considered unimportant.

From the long life and value of an apple tree its propagation becomes of the first consideration. The general practice followed by the tree grower or the nurseymen is to obtain the seeds of apples in the pomace taken from the cider mills. These are planted and five or six months later the seedlings are budded with the desired varieties. To the uninitiated it may seem peculiar that nearly all the apple trees now growing are made up of parts of two trees, the root grown from the seed of any apple, and the crown, taken from the desired variety and grafted on this seedling root when it was young. The fact is that seeds do not "come true." Plant 100 seeds taken from typical Baldwin apples and when the trees mature there may not be even one tree which will bear Baldwin fruit.

In budding or grafting the seedlings it has long been the practice to take the buds or scions from the young growing trees in the nursery. Trees that are propagated in this way have no particular character. They are without any special quality excepting one which is most prominent, that of growth. Where buds or grafts are continuously taken from young and growing trees in the nursery rows they are given the vegetative tendency or habit, and under good culture often continue, for many years after being planted, to bear little or no fruit. It is not uncommon to see trees growing ten or twelve years and often fifteen before any fruit is borne.

A better plan for propagation is to select the buds or grafts from trees that are mature and bearing fruit, those that have known and established qualities, among which should be vigor, early bearing, productiveness and uniformity in the size and shape of the fruit. These qualities are influenced by cultivation and fertilizing to a large extent, but in some trees they are inherent, and when such are discovered there is great advantage in propagating from them.

In growing trees in the nursery sufficient thought has not been given to the difference in seedlings. In truth they vary as much as the kinds that are budded or grafted upon them. Some are stronger and more vigorous than others, in which case, the union formed between the bud and the stock is more congenial and has greater firmness. Where such conditions are obtained the trees will be free from many of the diseases and weaknesses from which their weaker companions are liable to fall long before maturity.

The usefulness of an apple tree may be extended over so long a period, even beyond a century, that more thought and care should be given to these

important principals in its propagation. A few nurseymen are now beginning to work in this direction.

Location for an Orchard

After a superior tree has been produced it should be provided with such conditions or environment as will enable it to best utilize the advantages gained from good propagation. The choice of location is first in importance. This, if possible, should be upon a more or less elevated piece of land. The exposure is not essential though if a choice can be made a northern or westerly slope is best. The reason for this is that there will be less danger from injury to the trunks of the trees on account of winter sunshine which upon southern slopes sometimes proves injurious. The freezing and thawing that sometimes occurs when the sun shines directly upon the bodies of the trees in midwinter will cause what is known as "sun scald," which injures the bark. Where the land is rolling or hilly this choice of an elevated location is procurable, but if it is generally level, there is little choice to be made. On an elevation there is good natural drainage of water. Also during frosty periods blossoms and fruit suffer there less than upon a level position. Cold air, like water will always seek a lower level. Hence, it will roll down the hillsides upon frosty nights and the blossoms on an elevated place, if only of a few feet, will frequently escape injury when those on the lower level will be killed.

The freer circulation of air on a higher point ensures greater freedom from blights and fungous diseases while the longer period of sunshine through the day will give higher and finer color to the fruit. For the same reason there is greater freedom from insects that are injurious as they do not inhabit exposed situations, but rather seek sheltered places.

The Soil

TOP SOILS: The apple will exist on a great variety of soils. Even on a poor soil it will struggle to maintain its life and reproduce through its fruit, as reproduction is the real purpose of all animal and vegetable life. There are, however, certain kinds of soils that are much better suited to the development of apple trees than others. A soil that contains some clay in its composition is excellent. Trees will grow in a stiff clay and do well, but such soil is often over-saturated with water and trees do not grow well with too much water about their roots. Air, which is necessary for the roots of the trees, as well as for all plants, is frequently shut out by a heavy clay soil. Such soil unless well under drained will hold water for a long time particularly after heavy rains. Soil that is made of a mixture of clay and sand called a clay loam is admirable and would be the first choice.

Trees will grow on a sandy soil, but they will not grow as large, neither will they produce as much fruit. The apples that are produced on the sandy soil will not keep as long as those from a clay or a clay loam soil. The trees and the fruit on sandy soil are more subject to insect attacks, for insects thrive better in a dryer soil than in one which holds water a greater length of time. There are, however, variations in sandy soils that give loams which not only produce fine trees but an abundance of excellent and beautiful fruit.

SUB-SOILS: In selecting land for a country home or for farming, gardening, or fruit growing it is important to know about the character of the sub-soil. After examining the surface soil it is well to dig or bore down to the sub-soil to know of its character. The sub-soil in its organization is generally closer and firmer than the surface soil and holds water for a much longer time for which reason it becomes a most important factor. If the sub-soil should be very hard and almost entirely void of vegetable matter with its particles of fine clay closely knit together it is known as "hardpan." This is impervious to water and will therefore make the top soil soggy. If this hardpan should

lie up to within eight or ten inches of the surface it will be most undesirable for any purpose, for it will keep the surface soil too wet in the spring after heavy rains and in long dry periods will prevent the underground water from rising and distributing itself through the particles of the surface soil.

A sandy soil that may have underneath it a close sub-soil at a distance of several feet below would be very excellent for it would be abundantly supplied with water at all times, and good drainage of the surface soil would be assured. A soil of this nature may be worked very soon after a rain, an advantage worth considering. There is a great variation in the combination of clay and sand in soils. If there is a good depth of surface soil varying from nine to sixteen inches and if it is underlaid with a fairly close sub-soil (which may be deepened with a plow occasionally one or two inches and mixed with the surface soil,) excellent trees and fruit may be grown. Districts where there is lime stone in the soil are particularly adapted to fruit growing.

Preparation of the Soil for Planting

Before planting trees it is well to give the soil special preparation, but there are no hard and fast rules to which one must rigidly adhere. If one feels that he does not want to give time to careful preparation of the land before planting, he may take a short cut and yet establish an entirely successful orchard. Following the first plan, it would be well to have the fields planted in clover, for two years prior to setting the trees.

When ready to plant, plow the land in the autumn, excepting in extreme northern states as planting at this season is desirable. By full planting a gain in growth, often of two months, is obtained the following spring, if the season is late, wet, and cold and is followed by a dry period. If, however, there is no clover in the field, fall plowing should not be done, as the ground would leach too severely during the spring rains. If the plowing cannot be accomplished in time for spring planting, stakes may be driven, holes dug, and the trees planted without plowing, allowing such necessary cultivation to be done at a later time. There is much discussion as to whether fall or spring planting is the best. Fall planting allows the trees to start growth the following spring with other vegetation, instead of having to be delayed until frost is out of the ground and until the trees arrive. Many argue that the winter kills many newly planted trees, but the gain on the other side of the question is so marked that fall planting is highly advisable. Further than that, much better trees can be obtained in the fall than in the spring and further still, the nurserymen are as a rule so rushed in the latter season that it is impossible to have the trees when otherwise ready.

In laying the plan for an orchard, first decide upon the distance the trees are to be planted, then measure the spaces, and drive down stakes with strips of cloth tied to the ends so that they may be readily seen across the field. The stakes should be driven on the four sides of the piece of land to be planted with one row through the middle each way. Two men may then sight, one across the field in one direction to the opposite stake and the other in the other direction, while the third may mark the spot where each tree will stand in the exact line with the stakes used is sighting. In this way one may be sure just where to make the hole for the tree. It is important to have the trees stand in exact alignment as there is less danger from injury in cultivation, for, if the trees protrude or retreat much, they are more liable to be injured by plows and cultivators. If the field to be planted is not a rectangle it is easy for one to mark the places for the trees by following out the same general lines above mentioned.

Distances for Planting

The distance for planting will depend upon the policy that is to be followed. For standard trees of most varieties, 45 feet each way should be given

that they may have an abundance of room and light. A very general mistake is made of planting too closely. In more than half of the orchards in the country better apples would be obtained if half of the trees were cut out. When trees are set at this wide distance, interplanting may be done with dwarfs. These being placed in the centre, between the standard trees 22 1-2 feet apart. This plan will prove more profitable as many more trees may be planted to the acre and these trees will produce apples for at least 20 years, or until it is necessary to remove them for the benefit of the standard trees. It will require courage to remove these interplanted trees especially if they are bearing good crops, but it is essential to the development of the trees that are to remain permanently. If they are all left too long they will overcrowd both in the tops and at the roots and as a result the orchard will deteriorate. It is sometimes profitable to interplant once again with trees that are excessively dwarfed and which will bear a crop in three years.

Preparing the Trees for Planting

In buying trees from the nursery select standard varieties two years old. These will be from five to six feet high and will have well developed root systems. When the trees are received from the nursery they should be unpacked and placed in an open furrow in the soil and the roots covered with earth in order to keep them moist and in good condition until they are planted. If, by any means, the trees have been long delayed in transportation and seem dry and shriveled, they should be thrown in water and left for ten or twelve hours, after which they should be covered in the furrow as suggested.

When ready to plant, the roots should be pruned, cutting away all broken pieces and shortening each leg about one-third of its length. Then prune the top of the tree, cutting off all branches, except three, leaving those which have developed at a distance of three to four inches from each other and from two and a half to three feet from the ground after the tree is planted. Then cut off the remaining part of the top. The three branches are to form the permanent top of the tree, and should themselves be cut back one-third to one-half. Endeavor not to have the branches opposite each other as they will form a crotch which later when heavy loads of fruit are borne, is apt to split or break apart.

This severe pruning may seem sacreligious, but it is very essential to successful planting. The reason is obvious. When a tree is taken from a nursery much of the root system is lost and the top does therefore not balance with the roots. By this pruning an equilibrium is made which will allow the trees to continue in a normal manner, and far exceed any growth made by a tree planted as it comes from the nursery.

Planting

Dig a hole large enough to allow careful spreading of the roots. Loosen the soil at the bottom, spread the roots out as well as possible and put the remaining earth over them to a depth of about four inches, packing it as firmly and closely as possible especially about the roots. One man should hold the tree in a vertical position and step on the soil, pressing it firmly in place, while another man with a shovel should supply the earth until the work is finished. Tramping is important as the earth must be made firm over the roots. By this method of planting 100 per cent. should live and grow. When the tree is in position and surrounded by earth it should be 2 1-2 inches deeper than it was in the nursery, the latter distance being easily determined by examining the tree before planting.

Cultivation

When an orchard is planted the work should not end there, though, in too many instances further effort ceases. This is why there has never been over-

production of apples. If all the trees that are planted lived to produce fruit there would be many more apples than could be sold or used, but for the want of proper cultivation and care, not 50 per cent. of the trees mature. In commercial orchards, the soil should be thoroughly tilled. This operation will keep the trees in a vigorous growing condition. If the planting is done in a small or suburban lot, plowing and cultivation with horses may not be practicable; but the soil may be spaded or dug about the trees even if for only a distance of four or five feet, and the result will be beneficial. The soil may be raked or hoed frequently throughout the season thus keeping a dust mulch over the top.

In the commercial orchard it is well to plant corn for the first two years, as this will shade the young trees during the hot months of July and August, and the cultivation given the corn is excellent for the trees. Potatoes may be grown providing five hundred or six hundred pounds of special potato fertilizer is applied to the acre for each crop grown, otherwise, the soil will deteriorate. It is not wise to sow the small grains or to grow grass in young orchards. It is sometimes desirable to grow small fruits such as strawberries, currants and raspberries in the open spaces between the trees, leaving however, a space of not less than six feet along the row of trees for cultivation. These crops, if grown, should also be fertilized annually with five to six hundred pounds per acre of a commercial fertilizer. After the trees begin to bear fruit especially where they are interplanted with fillers, it is better not to grow other crops, but rather plow the soil in the early spring, harrow and cultivate it weekly until about the first of July. At that time sow red and crimson clover in equal parts at the rate of 18 pounds per acre, and cover the seed by harrowing the ground lightly.

Clover is so-called leguminous crop. In the presence of certain bacteria small nodules are produced on the roots which have the power of gathering the free nitrogen of the air. In this manner, it is therefore possible to give the soil nitrogen without spending money for fertilizer. Another object of clover culture is to cover the soil during the winter, which is highly necessary after the fine tillage it has received, to save the washing away of valuable fine particles of soil during the heavy rains of autumn and winter. Still another purpose in sowing clover is for the improvement of the soil texture. Clover roots penetrate deeply and bring up from the sub-soil unused plant food. It also adds to the vegetable matter or humus which is an important factor in holding and conserving the moisture.

The clover should be plowed under, the following spring, the soil again cultivated until the early part of July and then re-seeded with the clover mixture. Crimson clover being an annual will grow rapidly and make a large plant by the latter part of the autumn. The red clover having a longer tap-root will stand the winter better and will frequently come through the spring in good condition, while the crimson will be more or less killed by the freezing and thawing weather. The crimson clover, however, has done its work the preceding autumn and has left in the soil a good supply of nitrogen. Do not cut and remove the clover, rather leave it to nourish the soil.

There is much interest and discussion over a system of mulching the soil by allowing the grass to grow, then cutting it and placing it about the trees. While there may be a few favorable instances with naturally moist soil where this system will work quite satisfactorily, yet in the great majority of locations, this plan will not be wise to adopt. The tillage combined with the sowing of the clover as a cover crop will give far better trees and fruit. In the mulching system there is always greater trouble from insects and vermin. Field mice find this an excellent place in which to harbor and many trees have been ruined by them. Even though wire protection is placed about the trees, a deep fall of snow will permit the mice to girdle the trees above the wire. From these points it will be seen that it is not wise to plant orchards upon land that cannot be cultivated. There are, however, many orchards planted among rocks which live and thrive to a certain extent.

Varieties

In choosing varieties for planting, it is well to have them extend over all seasons, summer, autumn and winter. Apples now are so generally used, that they are wanted even in times when peaches and other summer fruits are plentiful. It is difficult to recommend varieties for all sections of the country. Those that do well in the north are not all suited to the south. The west also has conditions especially favorable to certain varieties such as soil and climatic fitness. An excellent rule to be governed by, is to study in each section, the varieties which are known to have done well over a long period, and to plant more largely of these varieties. For the northern and middle states a very good general list from which to select would be: for summer, Astrachan, Williams, Sweet Bough, Yellow Transparent; for autumn, Alexander, Gravenstein, Fall Pippin, Maiden Blush, Jersey Sweet, Duchess, Wealthy; for winter, Northern Spy, Rhode Island Greening, Baldwin, King, Hubbardston, Sutton, Roxbury Russet, McIntosh, Wagener and Lady Sweet. For warmer sections, such as the south and southwest, Jonathan, Stayman Winesape, Grimes, Golden, York Imperial, Gayno and Huntsman are among excellent varieties. The Ben Davis is well adapted to these sections, but it is lacking in flavor, and too many of this variety are being planted. Among some choice varieties for home use are the Chenango Strawberry, Richards Graft, Porter, Pound Sweet, Rambo, Esopus Spitzenburg and Cox Orange Pippin. The Cox Orange Pippin is a very rare English apple, but gives promise of being adapted to the middle sections of the U.S. The Newtown Pippin is well suited to the Hudson Valley, Va., and the northwestern states, Oregon and Washington.

Description of Varieties

THE ASTRACHAN is an early summer apple, yellow in color, splashed with red, excellent for cooking, and when allowed to ripen on the tree is a good dessert apple. Becoming somewhat soft on ripening, it is not suitable to ship long distances.

THE WILLIAMS is a beautiful red apple of excellent flavor, a favorite in Boston and other New England markets; it follows the Astrachan in season and is strictly a dessert apple.

THE SWEET BOUGH is one of the best early summer sweet apples, is yellow in color, with a slight blush, it is highly prized as a dessert apple, and is superior for baking.

THE YELLOW TRANSPARENT, a Russian introduction, is a very early summer variety, pale yellow in color when ripe, and is excellent for cooking. On account of its delicate skin, which easily shows marks, it has to be handled with great care.

THE DUCHES is another of the Russian varieties. The tree is very hardy and bears early, often at two and three years, while the fruit varies from medium to large in size, is yellow striped with bright red and is highly attractive. It is tender, juicy, crisp, and excellent for culinary uses, but it is too acid for a dessert fruit. Its season is August and September.

THE WEALTHY is a tree of great hardiness, and often bears at two years of age. The fruit is about medium size and pale yellow with strips and splashes of red. It is a heavy bearer, the fruit requiring thinning. It is of good quality for all uses.

THE GRAVENSTEIN exceeds the average size, is yellow overlaid with strips of bright and dark red, and is very attractive in color. It is one of the finest for culinary uses, and is equally good for dessert. It ripens unequally, and needs to be picked several times as the apples drop easily when near maturity.

THE ALEXANDER is another of the Russian varieties, and a large and very showy apple. It is striped red in color, and has only culinary qualities. The fruit is subject to decay, and the trees to blight. It is a popular variety in the market.

THE FALL PIPPIN is one of the best of the later autumn varieties, ripening in September and October. It is large in size, is a rich yellow color and excellent for all purposes. It is subject to the Apple Scab and needs thorough spraying, with Bordeaux mixture.

THE MAIDEN BLUSH is a beautiful yellow apple with a blush which makes it one of the most attractive; the quality is not of the highest, but is most excellent for cooking purposes. Under good culture, and thinning, the tree bears regular annual crops. This is one of the most profitable autumn varieties.

Among the few autumn sweet apples, the **JERSEY SWEET** is one of the best. Its color is a bright red and yellow, and it is good for both dessert and culinary use. Its season is September and early October.

THE NORTHERN SPY may be said to lead all later varieties for excellence in every respect. The tree is hardy and vigorous in growth. It has a strong root system, differing in this respect from most other varieties. This makes the tree a desirable one upon which to top work other choice but delicate growing varieties as it imparts greater vigor to them. The fruit is large, the color yellow covered with streaks and splashes of red and carmine which makes it most attractive in appearance. When full grown it is covered with a delicate bloom which adds to its attractiveness and beauty. The flesh is crisp, tender and juicy while its flavor is the highest, with a spritely pleasant acid, and is fine either for dessert or culinary use. This very excellent variety is not adapted to general culture. It is best when grown in the Hudson Valley, north of Poughkeepsie, in the Champlain district, and in central and western New York. It is also grown in its highest excellence in Michigan, Vermont, New Hampshire, Massachusetts, and the northern belt of the Connecticut. When grown in too warm sections it ripens prematurely, has poor flavor and keeping quality, often decaying on the tree before it matures. When grown in a warm climate, the tree is not so good for top working.

THE BALDWIN is the great leading commercial winter apple, more of which are to be found in the market than all other kinds combined. It is large in size, bright red in color, and has excellent shipping and keeping qualities. The tree is vigorous in growth, but in very cold sections is not entirely hardy. The Baldwin reaches highest perfection on Long Island, in southern Connecticut, and in the Hudson Valley. Grown in these localities, on account of its very fine flavor, it has high dessert quality, but in most sections, its chief value is for culinary use. It is particularly valuable for exporting and meets with great favor in foreign markets.

THE RHODE ISLAND GREENING ranks in value with the Baldwin; is particularly adapted to New York State, but is well suited to New England, and is as widely disseminated as the Baldwin. The tree grows to large size, is spreading in habit and much of the time bears annual crops. The fruit is large, green in color turning somewhat yellow when ripe. When grown to its highest perfection, it frequently has a handsome blush of red on one side. There is no better apple than the Greening for all purposes, while its crisp, tender flesh, delicious juiciness and high flavor make it one of the best dessert apples. There are known records where this choice old variety has sold for \$6.00 per bushel box. It is particularly prized by all New Englanders.

THE TOMPKINS KING ranks very high as a dessert apple; is large in size, a beautiful red in color with yellow shading when fully ripe, is tender, crisp, juicy, with a high flavor, the apples often selling for \$1.50 per dozen. The tree is constitutionally defective, being subject to several diseases, the most serious being canker and collar rot. By top working it upon the Spy, or Tolman Sweet trees, the King may be profitably grown in commercial orchards, and thus propagated, will live to 100 years of age.

THE HUBBARDSTON, like the King is an early winter apple, in season from December to February, and is an excellent dessert variety. Its color is yellow

streaked red, its size is large and its flesh crisp and tender, juicy and sub-acid. The tree bears early, usually in three or four years, annually, and, like the King, is subject to disease and is improved by top working.

THE SUTTON, usually called Sutton Beauty, is of the Baldwin type, and is a dessert apple. Its color is yellow splashed with carmine which makes it highly attractive in appearance. It is about the size of the Baldwin, and is in season from November to March. This variety is also better when top worked in which case it is a strong and upright grower. The tops of the trees need to be cut back frequently to keep them low headed and the fruit should not be picked until it is highly colored.

THE ROXBURY RUSSET is the best of the Russet family, it is a late keeper and is at its best in April and May after most other varieties have gone. The tree is strong, hardy and vigorous, while the fruit is of very excellent quality. It is a particularly valuable apple to ship to southern markets, and should be included in every commercial orchard.

THE MCINTOSH is of more recent introduction, but in point of fine quality ranks among the best. It originated in Canada, and is being quite widely planted. It is better adapted to northern New York, and northern New England, where it is a winter variety. In warmer sections it ripens too early in the autumn, is subject to apple scab, and would be disappointing if planted commercially. The color of the fruit is a deep red, the flesh is very tender, crisp, juicy, and highly aromatic, with a flavor that is exceeding agreeable. It is a tender fruit, and will not bear shipping long distances except when well packed. This variety should be wrapped and shipped in boxes.

THE WAGENER is a high quality variety ranking among the best. The fruit surpasses medium size, is a beautiful deep red in color with some yellow shading. The flesh is tender, crisp, juicy, sub-acid, of high flavor, and is one of the best dessert apples. After one has had the luxury of the Wagener for some time, he will feel somewhat dissatisfied with most other kinds, however good they may be. The tree is not an over strong grower and it would be improved by top working on a more vigorous variety. It begins to bear in three or four years, and is particularly valuable for planting in the filler system.

THE LADY SWEET is one of the best long keeping winter apples, frequently good in May. It is above medium size, handsome red in color and having a thick skin, is an excellent shipper and export apple. It is especially good for baking. The tree is a hardy and vigorous grower, and is adapted to a wide territory.

For the warmer sections **THE JONATHAN** is one of the most valuable varieties, although it does not grow to so large a size in the northern states. If given extra culture and fertilizing, it may be extensively grown and is of the very highest quality. The color is a beautiful deep red; in size, medium; the flesh, crisp, tender, juicy, and of a distinctly spicy flavor. It is a beautiful as well as excellent dessert apple. The tree does not grow to so large a size, but bears very heavily. If the fruit is thinned, the tree will bear annually.

THE GRIMES is a variety of high merit and especially adapted to a southern climate. It may be grown for home use in southern New England, and the southern portions of the middle states. While the apple is yellow in color and does not sell so well as red fruit, it is one of the best of the dessert kinds, possessing exceedingly good quality.

THE BEN DAVIS in appearance is one of the most attractive apples, but its quality is inferior, being good only for culinary use. It is best adapted to the warmer climate of the south, but even there it is being grown in too large quantities as buyers are beginning to learn that consumers do not want too many of them.

THE GANO resembles the Ben Davis, but is somewhat better in quality.

THE HUNTSMAN is another variety that succeeds in the South. It is some

what subject to scab and to bitter rot, two serious diseases, but its quality is good, and it comes under the list of dessert varieties.

THE YORK IMPERIAL is a handsome red apple and ranges from fair to good quality. It has the peculiarity of growing unequal in shape, one side of the apple being higher than the other. The tree is subject to Twig Blight, but the variety is in favor with southern planters.

Among the CRABS are some excellent and very beautiful apples. The Excelsior leads in size, and is nearly as large as Jonathan, equally beautiful in color and of excellent dessert and culinary quality. This is one of the largest and best of its class.

THE HYSLOP CRAB is large in size, is of a beautiful red color, covered with a delicate blue bloom.

THE LARGE RED AND YELLOW SIBERIANS are medium in size and very prolific in bearing. These are used largely for jelly and for pickling, and are excellent for these purposes.

THE TRANSCENDANT is another excellent crab of good size and quality.

The varieties named constitute the best and most desirable among the large number in this class.

Dwarfed Trees

Excepting in gardens, dwarf trees have not been much cultivated in our country. With the destructive work of some of the scale insects, and the increasing numbers of injurious insects, this class of trees is receiving more thought and consideration.

There are two types among them. The Doucin type are propagated by budding the desired variety on Doucin stocks or roots, making half dwarf trees that will grow from 18 to 20 feet high. The Paradise type are smaller trees and are more strictly dwarfed, being grown on Paradise roots, making smaller dwarfed trees. The advantage of these are that they may be more effectually sprayed and pruned with less labor, while the fruit may be thinned and all imperfect specimens taken off. The Doucin trees may be planted 20 feet apart each way, which would make 110 to the acre, and the Paradise planted between them in one direction, making them stand 10 feet from the Doucin trees, thus making upon an acre about 218 trees. The Doucin Dwarfs may also be planted between standard trees, the standards being planted 45 feet each way and the Doucin in between each way also at 20 feet. The Doucin trees come into bearing, if grafted with certain varieties, in three or four years, and they may be allowed to bear for from 15 to 20 years before it will be necessary to remove them. The dwarfed trees are well suited to suburban planting, as they require less space. The trees should be planted deeper than standards; the union between the bud and the stock seen by a slight enlargement at the junction, should be set at least 3 inches below the level of the soil. The reason for this deep setting is that the roots of the dwarfed trees are shorter, and do not extend out so far into the soil; hence when the trees are loaded with fruit, they are liable to blow over, as the tops become larger and the roots cannot hold them. With a much larger number of trees to the acre, and with all fruit made practically perfect, the financial results are most satisfactory. The cultivation must be intensive, and all methods will cost more than those generally practiced with standard trees, but it will be well worth the time and effort to test on a small scale the value of dwarfed tree culture in comparison with standards. The writer has over 1,000 dwarfed trees, some of which began to produce fruit at two years from planting, the third year getting as many as fifty apples to the tree, while on the fourth year, very satisfactory quantities of fruit were grown. Most varieties grown on standard roots will do equally well grafted on dwarfed stock.

It is not altogether wise to judge of a new proposition until it has been thoroughly tested, and as very few fruit growers have ever tested dwarf apple

culture in our country on a commercial scale, we are without definite knowledge upon the subject. It will be wise, however, to give these trees a fair trial.

Cultivation of Dwarfed Trees

The cultivation of dwarfed trees has to be done upon more intensive methods than standards. The soil should be thoroughly tilled for about three months. By constantly stirring the soil after it is plowed, the fine grains of soil are pulverized and thereby more available plant food is liberated. The fine roots of the trees as well as all plants obtain the necessary elements by taking up water in which these elements are dissolved. Therefore, the finer the soil is made, the more nourishment will be liberated, and proportionally greater will be the growth of the trees. It is vitally important to obtain as rapid development of a dwarfed trees as is consistent with healthy growth. As has been explained before, frequent cultivation also tends to conserve the moisture of the soil during long, dry seasons. Hence, intensive cultivation serves two purposes. A spring tooth harrow and an Acme harrow are two of the best possible tools. Set the spring tooth to a depth of 4 inches for the first cultivation, 3 inches for the second cultivation, and 2 inches for the third. The Acme harrow should then be used to keep the soil perfectly level by stirring the surface from one to one and a half inches only. As the soil dries rapidly after plowing, an immediate harrowing should follow.

As the temperature of the air begins to rise rapidly in May and June, the water that is in the sub-soil rises to the surface with corresponding rapidity and evaporates into the air. Frequent tillage breaks up the capillary passages that are formed by this upward pressure of water and prevents evaporation, thereby keeping the roots constantly supplied with water and incidentally killing the weeds that grow on the surface.

When the trees come into liberal bearing it is well to apply, once in two years, one two-horse load of well rotted stable manure to every 15 trees, and on alternate years to apply six pounds of commercial fertilizer containing at least 2 per cent of nitrogen, 12 per cent of phosphoric acid and 12 per cent of potash to each tree. This should be applied early in the spring after the ground has been plowed, and before the harrowing has begun. This method of fertilizing will keep the trees in vigorous growing condition, such that they will give regular annual crops.

Pruning

There are few operations about the management of trees that are so little understood as pruning. For this reason many trees are not pruned, while those that are, frequently are much injured by the process.

The first year after planting, little pruning will be required. The second year, only such branches as are inclined to grow in toward the middle of the tree, or those that tend to cross and interfere with other branches, need to be cut away. Branches which grow out beyond others should be cut back to give the proper balance to the tree.

The third year the head of the tree will need to be properly shaped by cutting off the leaders or those branches which grow upward from the centre of the tree. Make the trees as low and spreading as possible. If the leading branches are four or five feet long, they should be cut back 18 to 24 inches, a process which will give more active growth to all side branches.

If very large trees are desired, which will produce the greatest number of barrels of fruit, a pyramidal form should be adopted by leaving a strong leader in the center, allowing it to build out branches in all directions. With the necessity for control of insect and fungous diseases the low spreading form seems more desirable. In cutting off branches small or large, it is essential to

make the cut close to the body of the trees so that the bark may heal over rapidly. Where the branch comes out from the body or from a secondary branch there is a slight enlargement at its base. In pruning, cut close to, or through this, leaving the two shoulders of the cut as nearly equal as possible so that the sap flowing down from the leaves will form a cambium layer which will roll over the cut. Too often branches are cut leaving a stub of from one to six inches in length. Decay starts at the ends of these before the bark can heal over them, and as a result decay will soon be found in the centre of the tree. When pruning the outside branches of a tree, make the cuts as near above buds as possible so that they will heal rapidly and leave no small stubs. It is well to paint all wounds that are more than one inch in diameter. Any kind of paint will answer. Bordeaux mixture or coal tar are commonly used. Pruning may be done at any time of the year, although there are certain times when certain effects will be produced. If the work is done in winter, when the trees are dormant, the effect is to stimulate growth. If it is done in May or June, growth is somewhat checked. If the variety is of weak or slow habit of growth, prune when the tree is dormant. If, on the other hand, it is strong and vigorous, prune in June to give it some check, as this is the time the sap does not contribute so much to growth, but rather to the development of tissues, which, from that time on to winter, mature and harden to withstand a cold temperature.

It is thought that summer pruning has the effect to induce or hasten the development of fruit, spurs and buds, and to bring trees into bearing at an earlier date. The writer is carrying on extensive work in this direction and has a large number of trees three or four years of age bearing apples freely. Another feature of summer pruning is that the growth is apt to be diverted into the fruit and leaf buds for the following year. Such buds begin to develop the first of July. One special benefit from pruning is to admit the sun freely to the foliage of all parts of the tree. It is through the foliage that the food supply of a tree is digested. The food materials ascend through the sap wood to the leaves, which, aided by the influence of the sun, the taking on of carbon dioxide and giving off of oxygen, perform the digestion. This digested sap then works down through the cambium layer to the tips of the roots, forming new layers of wood, buds, fruit spurs and fruit.

An open system of pruning that will allow the sun to shine upon all the foliage will therefore give the best results in the northern and New England states. In the southern and southwestern states a method entirely opposite should be followed; that of protecting the branches and fruits by shading them, leaving the top of the tree quite dense and preventing the sun from scalding the fruit. The very high temperatures in these sections often do great damage in this respect.

The thinning of apples should be done when they are grown to one inch in diameter, as then defective specimens may be seen and taken off. If there is a heavy set of fruit one-third of it should be pruned away. The cost of thinning will vary on large trees according to the set of fruit from 45 cents to 55 cents per tree, and on young trees from 15 to 18 years of age, from 15 cents to 29 cents each.

A fine saw should be used in pruning and also a sharp knife. The blade of the saw should be narrow so that it may be turned at any angle, making it possible to prune every branch close. For larger work an ordinary seven-point saw is advisable.

Pruning shears are generally most objectionable, as they bruise one side of the branch, often cracking it so much that it will not heal rapidly. For clipping off the ends of smaller branches, it is often handy, however.

The Renovating of Old Orchards

If old orchards have long been neglected, as is generally the case, too severe pruning should not be done at one time. It is well to cut out not more than a quarter or a third of the over-crowded branches at one time, for when too many are cut away, nature will make an effort to replace them by forcing out a great number of suckers or small twigs along the bodies and branches of the trees, which later will have to be cut off. By cutting less at a time and taking a longer period in which to put the old trees in order, labor will be saved, and it will be much better for the trees. In the attempted renovation of old orchards, another serious mistake is made in cutting away too many small limbs from the long main branches. This causes all of the new growth to be made and fruit to be grown on their extreme ends, which operation is often followed by breaking down of the large branches when heavily laden with fruit. The ordinary system of pruning as practiced by the inexperienced is to cut off every branch on every main limb until there is merely a bouquet on the end. On the other hand, it is wise to leave large branches scattered along the limbs and yet get the open effect. Where a tree has been pruned in the wrong manner, a few of the suckers or twigs that have started should be saved and allowed to grow, thereby filling up many of the large holes in the top of the tree or filling in the centre to a certain extent. Suckers may be allowed to grow every five or six feet, and they will be found to bear excellent fruit. Where the trees have very high tops they may be cut down ten or twelve feet, the ends being cut in a slanting direction to prevent decay. Not more than two branches should be cut in one year, as the shock might otherwise be great enough to injure the tree. In this manner old trees may be gradually renewed, tops lowered, and larger crops of excellent apples grown on the new branches. The ordinary 10-foot pruning hook is admirable for much of this work.

Spraying for Protection Against Insects and Disease

This has become an adjunct in the care of trees that a few years ago was unknown. With the more extensive planting of recent years, conditions have been created for the increase of all kinds of insects that prey upon cultivated trees and plants. Our international trade relations have become so greatly extended, that we have brought into our country from foreign ports a number of new and formidable pests. The San Jose scale, the gypsy and brown-tail moth, and others like the cabbage and currant worms, are causing immense annual losses.

There are two types of insects that need to be known and understood if they are to be intelligently fought. One, the leaf-eating insects which have biting jaws and chew or bite the foliage or fruit. Two, the sucking insects which have piercing tubes with which they suck the sap from leaves and branches. In this class is the aphid or plant louse. The first class has to be treated by means of spraying poisons upon the foliage and fruit. The other type is sprayed with oily substances that come into immediate contact with the insect and kill it by corrosion or form a thin film over the breathing pores, this suffocating the insect.

The apple has a large number of insects that prey upon it, but there are few, however, that cannot readily be controlled. It is merely a problem of applying the necessary knowledge at the correct time of the year.

Apple Tree Tent Caterpillar

This is one of the earliest apple pests to appear in the spring. The life history is as follows: The moths appear in July and lay eggs in clusters of about 200 in number, fastened about the twigs by a substance resembling shellac, but

which is gummy at first. The color of the cluster is dark brown. The eggs remain dormant until spring, when the caterpillars hatch and feed upon the young foliage, making a web in the crotch of two branches. If there are several warm days before the foliage appears, they are apt to hatch earlier and feed on the young buds, thereby seriously injuring them. They usually appear in May and their nests enlarge as the caterpillars grow until at the end of about six weeks they are slightly over an inch and a half long, black in general color, and have a white stripe running down the back with a few short, yellow hairs on the side. They soon pupate upon reaching this size, and a fortnight later emerge as adult moths.

As soon as the eggs begin to hatch, spray the trees with arsenate of lead at the rate of 2 pounds to 50 gallons of water and they will be easily killed. The poison will also kill other insects even though they do not appear at the time, for it remains on the leaves for several months. If there is no spraying apparatus at hand, tie a small bunch of cloth to the end of a pole and run it up into the lower portion of the nest and then give a rolling motion so that the threads of the nest will be twisted about the pole and together with the caterpillars can be brought down. This is easily done, especially on low-headed trees, but care must be taken to do it in early morning while the caterpillars are in their nests. There are several useful parasites, among them the ichneuman flies, which pierce the eggs, and also others depositing eggs on the bodies of the caterpillars, which on hatching feed upon and kill them. Some seasons these parasites are so numerous that they leave no caterpillars to come forth the following year, while at other times the conditions are just the opposite.

The Codling Moth

The Codling moth is one of the most serious of the insect pests, as it does much damage to the fruit. It was imported from Europe about 100 years ago and has spread through all sections of the United States. Each female moth lays about 50 eggs just after the blossoms drop in the spring. She flies from one apple to another, depositing one egg in each flower. In about six or seven days the eggs hatch and the larvae begin to bore into the apples and there remain about four weeks, when they become full grown and eat their way out through the apple. The apple frequently drops at this time and the insect crawls on to the ground. It then crawls up the bodies of the trees, selecting a sheltered spot under the bark, or else hides under fence boards or any rubbish that may be lying about in the orchard, and there spins a cocoon. Changing its habit of life to the adult moth in about two weeks, it goes forth to lay eggs for a second brood or remains in the dormant state until the next spring, according to the climate. The eggs for the second brood are laid anywhere on the tree, but most of the larvae enter the side of the apple.

The most effective method of dealing with these insects is to spray the trees as soon as the blossoms have fallen with 2 pounds of arsenate of lead, dissolved, in 50 gallons of Bordeaux mixture. The latter is a fungicide and has no effect on the insect, but is used to prevent the foliage and fruit from being attacked by the apple scab and other fungi which cause the foliage to fall prematurely and the apples to be covered with black spots. This Bordeaux mixture is used with the arsenate of lead in the place of clear water to avoid two sprayings. The mixture is made as follows: Four pounds of sulphate of copper should be suspended by means of a gunny sack at the top of a barrel containing 25 gallons of water, allowing it, however, to be totally immersed. It will dissolve in a few hours. Four or possibly five pounds of lime are slacked and dissolved in 25 gallons of water. The two ingredients are then poured together simultaneously in a 50-gallon barrel. To these 50 gallons of Bordeaux mixture the 2 pounds arsenate of lead is added, and thus with one operation in spraying both the fungous

diseases and insect pests are controlled. In making the Bordeaux mixture it is important that the lime and copper be diluted separately, as when being poured together in the manner described they make the necessary chemical combination, remain in solution longer and the spraying can be carried on without having the nozzle clog. It is also very essential to get lime that is freshly burned in order that it will not have become air slacked. When the young larvae of the Codling moth hatch, they generally crawl around in the blossom end of the apple, eating as they go. Hence, the smallest particle of poison deposited inside the blossom will destroy the worm before it bores into the fruit. Care must be taken not to spray the orchard until the blossoms have fallen, for otherwise the bees which fertilize them will be destroyed.

Some eggs are laid on the leaves and twigs, and as a double precaution it is necessary to spray the trees with the same mixture within ten or twelve days of the first. A third spraying should be given again by the middle or last of July to destroy the second brood, which, as has been said before, is common in certain localities of the country. The second brood works into the apple from the side, generally speaking, hence, at this time, care must be given to spray the fruit. As the apples are small at this stage, the poison will wear off before harvest time. By spraying with these mixtures at the times recommended, over 90 per cent perfect fruit may be obtained, while without spraying not over 30 per cent will be had.

There are few other biting insects that in some years are quite numerous. The bud moth works in the apple buds very early in the spring and destroys many of them. The canker worm sweeps over entire orchards periodically, eating up all the foliage. In the spring of 1908 this insect was particularly numerous. The yellow neck and red humped apple tree caterpillars are apt to appear in late autumn. The one effective remedy for all these insects is arsenate of lead, the only difference being that 3 or 4 pounds should be used instead of 2 pounds. Bordeaux mixture should not be used in the third or last spraying generally, as at that time the fruit is beginning to mature and it would tend to discolor it somewhat.

The Fall Webb Worm

This is an insect that injures the apple trees beginning in the late summer. As they make their tent, they are often mistaken for the apple tree tent caterpillar, but they come much later in the season. The moths lay their eggs from June to August, according to the climate, and the young caterpillars which hatch soon after eat the green matter from the underside of the leaves, skeletonizing them, and enlarging their tents as they increase in size and spread over the trees. As these caterpillars always remain in their tent and work under it, they cannot readily be sprayed, but may be taken out of the tree with a pole as described for the treatment for the tent caterpillar, or the infested branches may be cut off and burned. The fall web worm is found on many forest trees, especially the ashes, but their damage is only slight.

The Apple Tree Borer

The flat-headed apple tree borer is responsible for the loss of many young trees. It bores in, either at the base or crown of the tree, and is a native pest, widely scattered over the country. The adult of this larva is a small beetle, and lays its eggs on the bark of a tree. When they hatch in June or July, the larvae begin to eat through the bark, often girdling the entire tree. Later the borer, with its strong biting jaws, works into the centre of the tree and often going upward finally emerges at a different place, escaping in the form of a beetle.

Trees should be closely examined in June, and if a fine saw dust is found at the base of the tree, a soft wire should be run into the hole in order to kill

the borer. Another effective way to destroy this insect is to inject a small quantity of bi-sulphide of carbon, with a very small syringe, covering the hole as quickly as possible with earth. Being volatile, this liquid will evaporate into a gas, bringing death to the insect. By a careful system of cultivation there is much less danger from these insects, as many of the eggs are apt to be destroyed.

The Apple Aphis

Of the sucking class of insects, the apple tree aphis is one of the most persistent. By close examination of the bark at the base of the buds, and in the crevices of the bark of the twigs, very small oval eggs, black in color, may be seen on infested trees. These are the eggs of the apple tree moth. They are deposited in late autumn. When the buds begin to swell in the spring the eggs hatch and produce very small lice which insert their beaks or sucking tubes into the buds and young leaves and subsist upon their juices. The first brood are all female and reach their maturity in about ten days, when they give birth to living young for a period of two or three weeks. Then they die.

Each new brood matures in ten days and likewise gives off living young. Hence, with several generations, each maturing in ten days, the geometrical increase is enormous. By the middle of July many trees will be covered with them to the extent of millions.

The leaves having sap taken from them so readily curl up, dry and drop prematurely. Young twigs are very often affected in the same manner. In late autumn both males and females are produced, and a stock of fertile eggs is laid for the continuance of the species the next year. Plant aphis produce a sweet liquid called honey dew which is secreted from a pair of tubes on the posterior part of the abdomen. This is used as food for the young and the surplus is greedily taken by black ants which are seen running up and down the trees. The ants protect the aphis and will vigorously fight for their preservation. They have been known to take a species of aphis living upon the roots of corn into their quarters and there care for them during the winter, carrying them back to the corn fields the next spring. Not until this discovery was made and the ant hills destroyed were the enormous losses in the corn crop of our western states, prevented.

To control this insect, the trees should be sprayed as soon as the first brood is hatched, using 1 pound of whale oil soap to 7 gallons of water, drenching the trees thoroughly. Some of the best scale destroyers may also be used at given rates. If the first brood is destroyed, little trouble or injury will follow, but if the matter is delayed, a second and even a third spraying may be necessary. The aphis has a large number of natural enemies. Myriads of them are destroyed by the lady bird and their larvae as well as by the syrphus flies.

The San Jose Scale

The San Jose, or Pernicious scale, is one of the most important insects that we have to fight in apple production. It has annihilated fruit industries over entire sections of countries. Being a very minute insect it is hard to find. The first prominent evidence of its presence in an apple orchard will be found in the red ring-like spots surrounding each insect upon the apples when they are ready to be picked. By further examination they may be observed upon the branches in the form of small, round, conical forms with a dark spot or dot in the centre of most of them. They are no larger than half the diameter of the shaft of a pin. By scraping them, an oily substance will be observed, and the yellow, soft bodies of the insects may be seen. By cutting the bark it will be found to be of a reddish color underneath, often extending to the wood. The scale spreads with alarming rapidity when it once becomes established, in a few years entirely encrusting the branches of the trees. Usually the first brood appears in June,

and thereafter broods come out frequently day by day throughout the entire season. Three or four individual insects in the spring will have millions of progeny by autumn. They are carried from tree to tree upon the feet of birds while they are in the early stages of their larval life, before the scale begins to form over them. They also adhere to feathers of birds. Nursery stock forms a method of spreading extremely dangerous.

The scale lives upon a large variety of trees, including nearly all of the fruits, as well as some of the forest trees. They also infest currants, roses, and many shrubs. It is not, however, impossible to control them. A combination of lime and sulphur has been generally used, and where the application has been well made, the results are excellent. Twenty pounds of lime, fifteen pounds of sulphur and fifty gallons of water should be boiled for one hour in order to make the proper combination. As it has to be applied while hot, or a short time afterward, it is most difficult to use. The materials being caustic, are very disagreeable, often burning both the men and the horses. There are several miscible oils, some good, some bad, that are now on the market. The advantage of these is that they are readily mixed with cold water, and do no damage to the operators. There are mechanical mixtures of lime and sulphur now being prepared that promise to have equal value as an insecticide, and which may also be used in the place of Bordeaux mixture.

Spraying for the scale should be done in the late autumn, as soon as the foliage has dropped from the trees. At this time the covering of the scale is thin and hence the material is more effective. Some of these materials penetrate the scale coverings and kill by contact, and others form a film cover and kill by suffocation. A second spraying in late winter is sometimes necessary.

The Department of Agriculture has been importing some of the parasites of this pest from China, the country from which it was originally imported. These have spread considerably in the southern states but as yet have not survived the cold of the North. Again comes the demand for the low-headed type of tree which can be readily sprayed. With the new and improved apparatus for spraying as well as the new compounds which are being perfected, this insect may be successfully controlled at a small cost per tree.

Oyster Shell Scale

This imported insect came from Europe a century ago, and like many others, when introduced into new territory, was found to thrive in a new environment, free of its natural enemies. It has spread all over the United States and resembles the oyster shell in shape, from which it takes its name. Generally they are not common on apple trees, or at least not common enough to do serious injury, but here and there is found an orchard badly infested. Underneath the scales are masses of eggs ranging from 25 to 100 in number. The latter part of May or early June the eggs hatch and the young move out toward the smaller branches, where they settle down, and insert their beaks in through the bark and subsist on the sap of the tree. Like the San Jose, they throw off their molting skins as they grow and these form what is known as the scale, and which takes the form of an oyster shell. As soon as the insect under the scale becomes adult, the eggs are laid in the larger end of the scale.

To keep these in check, the trees should be sprayed with one pound of whale oil soap to 7 gallons of water, or with any of the good scale destroyers now on the market. Spraying should be done about the middle of June, and if repeated the following year by a second application, there will be but little further trouble from the insect.

The Apple Maggot

This insect is also known as the railroad work from its habit of working throughout the apple making fine discolored lines in all directions. The adult

is a small fly with a sharp ovipositor. It punctures the apples in July by means of this appendage, and deposits the eggs underneath the skin in the pulp of the fruit. In the autumn or when the apples fall from the tree, the maggot is ready to change. It leaves the apple, burrows into the ground, and there remains in the pupa form until the following season when the adult fly appears. There is no appearance of its presence until the apples are cut for use, when they reveal these discolored lines and spots. As the eggs are deposited under the skin there is no way to reach them by spraying. The only known remedy for their control is to pick off and destroy all fruit affected early in August before the larvae leave the apples. This will prevent their further propagation and spread. It is far better to sacrifice one crop or even two than to have them remain in the orchard and destroy several crops. It is also well to pick up all the apples that fall as soon as possible before the insects have a chance to leave. Another excellent practice is to plow the soil in the autumn. This will turn up the pupae, the form in which they spend the winter, and they will be quite generally killed by winter freezing. If orchards were given more general tillage, many of the insects that go to the soil to pass through their pupal stage, would be checked, and often exterminated.

Summary

While the foregoing description of the few most prominent and injurious insects that have to be fought in the culture of the apple may seem somewhat discouraging to those who desire to produce fruit, it is really not as great as may appear. The apple grower needs but to reflect that he was created with unusual power, and man was given dominion over everything, including every "creeping thing that creepeth upon the earth," and that it is necessary only to assert his superiority and keep the control. If he becomes discouraged and allows the insects to acquire dominion over his trees, then the insects have given evidence of their superiority. There are, however, generally speaking, only a few insects which have to be carefully fought. The Codling moth is present every year, and must be sprayed at least twice. The San Jose scale being particularly destructive, should be carefully watched and if its presence is detected should be sprayed every year. The railroad worm is quite common, but as a general thing the other insects are found only occasionally. The owner of a fair sized orchard should have a barrel pump equipped with two 75-foot lengths of hose, two gas pipe spraying rods 10 feet long, and two nozzles of the best type. With one man at the pump and two men spraying, the cost can easily be reduced to a low figure for codling moth, but somewhat more for scale spraying. The operation of spraying is, in itself, not difficult. Care must be taken, however, to use a fine, mist-like spray, applying it so thoroughly that it will not skip a leaf, or if done in winter, a twig, and yet so carefully that the solution will not drop from the leaves any more than is necessary.

The Handling of Apples

Important as is the cultural work, such as the control of insects, pruning, and fertilizing, there is yet an equally important part, namely, the handling. Upon this depends largely the value to be realized. Many good apples are grown, but from that time on they are frequently depreciated in value on account of poor handling. Good ladders and baskets should be provided where the fruit is to be gathered from high standard trees. If possible, purchase basswood ladders, as these are light and strong. The pine and spruce ladders ordinarily used are from 18 to 20 feet long and are too heavy for general work, as the pickers often let them fall against the trees, knocking off and bruising the fruit. Local hardware dealers can easily supply orchardists with what is known as the topping ladder. Baskets holding a half bushel are generally used.

The pickers should begin at the lower branches of the tree, working upward to the top. The baskets should be supplied with strong iron or wire hooks such that they can be hung on the rounds of the ladder or on the branches of the tree and thus be kept close to the picker. The actual operation of picking is important, and one should turn the apple up in the opposite direction from which it hangs instead of pulling it from the tree. By the former method they should easily break from the fruit spur without damage to the spur itself. If, however, the stems break and the apples do not come off readily, they are not sufficiently matured and should be left a few days longer. The opinion is quite general that apples should be picked before they are fully matured in order that they may keep well, but this is incorrect. They should be allowed to remain until they have obtained their natural high color. Fruit that is allowed to get this color and be well matured on the trees is not only very much finer in flavor, but will keep better and longer. For instance, a bright red and yellow Northern Spy is tender, crisp, and most delicious in its flavor, but one that is green or only partly colored is insipid and unsatisfactory. In handling apples, they should be placed in the basket and not thrown into them by the picker. They should then be carefully turned from the baskets into the boxes or packages and carried into the packing room. Bags hung over men's shoulders are sometimes used in the picking, but they are objectionable, as the fruit is more or less bruised from this method.

Apples should never be put in piles on the ground, as is too generally the custom when the crop is being harvested. The reason for this is that the earth is still warm from the summer temperature and where great piles of fruit are made the heat passing from the earth up through them forces further ripening, and as a result the fruit will not keep as long as otherwise. It is preferable to sort and pack them as soon as they are picked and keep them in as cool a place as can be provided in some well ventilated building, or else put in cold storage. In carrying them from the orchard to the packing room, it is advisable to put them in bushel boxes, as in this way they may be hauled quickly and easily.

Packing and Packages

In the marketing of apples, the package in which they are placed determines to a great extent the value that will be realized from them. The great bulk of apples grown are packed and shipped in barrels. For many years the cost of a barrel was 25 to 28 cents, but these prices have been steadily advancing, and in late years the price has been from 40 to 50 cents each. Barrels are desired by the general trade, the commission salesmen and grocers who sell the apples in small quantities, and they are also extensively used in export shipping.

Boxes are preferred by the fancy fruit dealers and those who sell only the finest apples, and this is the trade which brings the greatest net returns. For a long time boxes could be obtained for 10 cents, but they have now advanced to 16 cents. The size of the box most generally used is of the following inside dimensions: 9 inches deep, 18 1-2 inches long, and 11 3-4 inches wide. The end pieces are 5-8 of an inch thick, and the sides in one piece 1-2 of an inch thick, while the tops and bottoms are in two pieces, 5-8 of an inch thick. A box this size will hold 40 pounds of fruit, or very nearly one bushel.

Packing Apples

Careful packing requires care, knowledge and skill which is too little understood and practiced by many fruit growers. First the apples should be evenly graded. For this purpose a so-called grading table is desirable, and the apples are turned into it as they come from the orchard. These tables are of various forms, but a simple plan is as follows: Make a table 12 feet long, 40 inches wide, and 36 inches high, securely braced so that it will be perfectly firm. On the centre of the

table erect a light frame running the full length of the long way, 16 inches wide, and 16 inches high. Divide this frame by cross pieces into seven compartments each about 20 inches long. On these rectangles above the table 20 by 16 inches tack pieces of gunny cloth or grain sack so that pockets will be made. Men or women on one side of the table sort the apples according to their perfection into the various pockets, while those on the other side are required to pack them either in boxes or barrels according to grade.

If the apples are packed in barrels there should be two sizes—one running from medium to large and the other smaller. All should be free from blemishes and defects.

In starting to pack a barrel, the fruit should be faced by placing on the head of the barrel, which is upside down, a good average selection with the stem end next to the head; in other words, upside down, so that when the barrel is finally open the fruit will look uniform and attractive. The same grade and quality should then be put in the barrel until it is filled, shaking the barrel occasionally that the apples may settle closely and firmly together. When the barrel is filled, the fruit should project one inch above the end. After placing the bottom pieces over the fruit a barrel header should be used. This device has a screw on the top that puts heavy pressure on the fruit, so that there is no possible moving of the apples after the barrel is closed. The apple header would apparently bruise and crush the fruit, but they are not in any way injured, as they have certain elasticity. When the header is screwed down, the bottom of the barrel may be nailed down securely and the header removed. It is well to place corrugated pasteboard on the inside at each end of the barrel, as it will often keep the fruit from being injured.

To pack in boxes, it is necessary that more grades should be made, and only selected fruit should be put into these. The selected grades should run according to the variety. Four tiers to the box if extra large apples are used would make three and a half tiers packed, while the next grade would make five tiers. Each apple should be wrapped in plain white newspaper cut in sizes to fit each grade, from eight to eleven inches square. With skillful packers the wrapping and placing in boxes is done rapidly and the cost should not exceed 6 cents per box. Much of it is done at the cost of 5 cents per box. In covering the boxes a heading table is used, for which an iron frame is constructed with two arms that project across the end of the box, and with the aid of a foot lever and spring the cover is squeezed down and nailed. Corrugated pasteboard pieces are used at the top and bottom of the box inside.

In packing a policy of absolute honesty in adhering to a uniform grade and quality should be strictly maintained. The facing of barrels or boxes with fine fruit and filling the middle of the package with inferior quality, is a fraud which, whether perpetrated by a grower or a dealer, should be as severely punished as for the forging of a note or for obtaining money under any form of misrepresentation. The extent to which this dishonest packing of fruit has been practiced has been a serious injury to both the growers and consumers of apples. It is generally done by adventurers or speculators who have no reputation to lose. First class dealers of fruit insist upon standard packing, for they understand the necessity of maintaining the confidence of their customers; likewise, the grower needs to maintain the confidence of the dealer.

Utilizing Waste Fruit

There is always a certain amount of fruit that is unfit for the market. Wind storms frequently blow off large quantities, and usually this grade will not pay for shipping. These may be made into vinegar or jelly or may be evaporated.

If there is an evaporator near by, this class of apples may be sold. If there is no outlet in this way, portable cider mills and presses may be used, making

the waste fruit into vinegar. Since the pure food legislation has gone into effect, pure cider vinegar is used more freely and brings much better prices than when cheap adulterations were made and sold.

In order to make vinegar, a good room is required where the cider may be kept until it ferments enough to possess the required amount of acid. The room should be moderately warm, and have a free circulation of air. Cider may be boiled or evaporated and made into jelly. A rather better grade of apples is used for this purpose. There are small portable dry houses made for small quantities, but especially where there are many windfalls, a larger building may be necessary. If a large evaporator may be reached, it is better for the individual fruit grower to sell his apples than to attempt to evaporate them himself. Where there are large orchards on an individual farm, an inexpensive building may be erected that will evaporate from 75 to 150 bushels a day, and the cost of such a building will range from \$900 to \$1,200. If one is contemplating the construction of such a building, it would be well for him to go to the apple growing section where such buildings are numerous and obtain plans for the same. When apples are very abundant and prices low, the entire crop is sometimes shaken from the trees and evaporated. There is a difference in the amount of dried apples that the different varieties will produce, ranging from 6 to 9 pounds to the bushel of white fruit, and this usually sells at from 6 to 7 cents a pound. The skins and cores are also evaporated, and these are largely exported to France, where they are converted into cider, vinegar, jelly, and sometimes champagne, selling for 1 1-4 to 1 1-2 cents a pound, while the small apples, chopped, sell for 2 to 2 1-2 cents a pound.

Storing of Apples

It is important that some provision be made for the storing of fruit, both for home use and for marketing. Storage facilities make it possible to distribute the fruit over a large territory, thereby preventing an over stocking of the market. By means of this, fruit may be stored for many months until the following spring.

Where there is a large local apple growing industry the members would do well to establish a local cold storage building at their shipping station and put their apples into it as soon as they are packed. If this is not possible, it is well for individual growers, producing several car-loads, to ship direct to a large cold storage house in the city. This places the fruit where it can be quickly taken out and sold when the market is most favorable. The temperature in these storage houses is kept exceedingly uniform, varying not more than one-half to one degree for months at a time. Refrigerator cars are used to avoid high temperatures and dangers of delays when the fruit is on the railroad.

Consumption of Apples

There is a constantly increasing consumption of apples. The fruit may be used in so many ways, that it is always in favor as long as it will last. There is too great a difference, however, between the price which the grower receives and that which the consumer has to pay. The broker or the dealer adds the cost of transportation and a reasonable profit to the price the grower receives. The retailer adds his profit and the consumer has to pay generally an advance of 200 per cent over the value which the grower received. The retailer has to run the risk of loss from decay, but if instead of asking such high prices, he asks less, larger and quicker sales would result to the benefit of the grower, the retailer and the consumer. It is hoped that a better equilibrium may be established in this trade in the near future.

Pleasure and Profit

There are few occupations that give more pleasure than that of the care and

development of an apple orchard. It is always an object of increasing interest to watch its growth from year to year as the trees expand in size, to direct them, mould and shape them into beautiful form, catch the beauty and fragrance of the first blossoms, and finally to gather the perfect fruit, and experience the satisfaction of having had intelligent control over every element that has contributed to the perfect results.

Apple trees may be used much more than they have been in ornamental planting and in landscape work, as they form a most attractive setting about the suburban house. They may be also used in border planting, and massed and grouped in ways to obtain beautiful color effects, when in full fruit. Their blossoms, too, are unexcelled for beauty. They may also be planted in a thousand places on the farm, and every one of them will help the general farm income.

The profit in the culture of apples is determined by the amount of intelligence and skill that are employed. The soil and trees are both responsive to good treatment. There has been outlined above a general system to be followed. It may seem to the prospective grower that there is much to cope with; on the other hand, there will be found a most satisfactory return for all money, labor and time wisely expended.

An investigation made in 1898 concerning the value of land used for orchard purposes gave some interesting facts. Twenty farms in western New York upon which the orchards were considered a secondary interest and were given no special care or attention, produced on an average of \$85 per acre for the apples. This was for a period of five years, and during two years of the five, no apples were borne by the trees. One where better care was given produced \$110 per acre as an average for the five years, another produced \$140 and in one year produced \$700 worth of fruit per acre. During the years of 1906-7 there are records of \$1,000 income from an acre, of which 35 per cent had to be deducted for cost of cultivation, spraying, picking and barreling. Taking the lowest income that was received, namely, \$85 per acre per year, the net annual profit exceeded the value for which much excellent land may be purchased. There are many thousands of acres of good land that can be bought for \$20 to \$70 an acre. These will furnish homes and work for many who have a love for nature as well as a desire to engage in congenial work and by it to secure a sure and satisfactory income.

To the readers of this course the Boston Naturebureau offers its aid in helping the owner of an orchard to do the work in the best manner. It will cheerfully give such advice and instruction as is possible where and how to get the best and cheapest supplies for the work, how to obtain further needed information, and to work out the highest degree of success with one or with many trees.



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